JOSEPH P. RUSSONIELLO (CABN 44332)
United States Attorney

BRIAN J. STRETCH (CABN 163973)
Chief, Criminal Division

JEFFREY D. NEDROW (CABN 161299)
Assistant United States Attorney

150 Almaden Boulevard, Suite 900
San Jose, California 95113
Telephone: (408) 535-5045
Facsimile: (408) 535-5066
E-Mail: jeff.nedrow@usdoj.gov

Attorneys for Plaintiff

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA, Plaintiff, v. BARRY BONDS, Defendant.	CR No. 07-00732-SI DECLARATION OF LARRY BOWERS

I, LARRY BOWERS, declare:

1. This declaration is intended to supplement a declaration which I signed on January 26, 2009. As described in that declaration, I am employed as the Chief Science Officer for the United States Anti-Doping Agency (USADA). In that capacity, among other duties, I am involved in overseeing the education and research mission of USADA.

2. I have reviewed pertinent portions of the defendant's reply brief filed on February 2, 2009. As a part of their argument, the brief appears to suggest that there is a difference between testosterone and anabolic steroids. This is not accurate. An anabolic androgenic steroid, by definition, is functionally similar to testosterone.

3. As I stated in my January 26, 2009 declaration, it is my opinion that anabolic steroids, including supra-physiological doses of pharmaceutical (or exogenous) testosterone, can cause a variety of physiological effects in a person, including increased hair growth on the trunk and extremities (primarily in women), male pattern baldness, the development of acne, particularly on the upper back, decrease in testicular size, increased aggressiveness, feelings of invincibility, "roid rage," weakening of the heart, hypertension, injury to the liver and possible links to prostate cancer. All anabolic steroids have these effects.

4. My bases for my opinion regarding the effects of anabolic steroids include the following:

a. It is generally accepted knowledge within the scientific community that anabolic steroids can cause a variety of side effects. I am familiar with basic medical texts, such as Williams Textbook of Endrocrinology and Goodman and Gilman's The Pharmacological Basis of Therapeutics, which describe these effects.

b. As an invited editor of a 2009 special issue of the journal Steroids, I reviewed the scientific literature on the side effects of steroids and incorporated these references into an editorial written with Dr. Richard Clark. These peer-reviewed studies include the following:

1. Perry PJ, Lund BC, Deninger MJ, Kutscher EC, Schneider J. Anabolic steroid use in weightlifters and bodybuilders – an internet survey of drug utilization. Clin J Sport Med 2005;15: 326-30
2. Ishak KG, Zimmerman HJ. Hepatotoxic effects of the anabolic androgenic steroids. Semin Liver Dis 1987;7: 230-6
3. Søe KL, Søe M, Gluud C. Liver Pathology Associated with the Use of Anabolic-Androgenic Steroids. Liver 1992;12:73-9.
4. Socas L, Zumbado M, Pérez-Luzardo O, Ramos A, Pérez C, Hernández JR, Boada LD. Hepatocellular Adenomas Associated with Anabolic Androgenic Steroid Abuse in Bodybuilders: A Report on Two Cases and a Review of the Literature. Brit J Sports Med 2005;39: e27
5. Nottin S, Nguyen LD, Terbah M, Obert P. Cardiovascular effects of androgenic anabolic steroids in male bodybuilders determined by tissue Doppler imaging. Am J Cardiol 2006;97: 912-5
6. Krieg A, Scharhag J, Albers T, Kindermann W, Urhausen A. Cardiac tissue Doppler imaging in sports medicine. Sports Med. 2007;37: 15-30.
7. Fineschi V, Baroldi G, Monciotti F, Paglicci Reattelli L, Turillazzi E. Anabolic steroid abuse and cardiac sudden death: a pathologic study. Arch Pathol Lab Med 2001;125: 253-5.
8. Nieminen MS, Rämö MP, Viitasalo M, Heikkilä P, Karjalainen J, Mäntysaari M, Heikkilä J. Serious cardiovascular side effects of large doses of anabolic steroids in weight lifters. Eur Heart J 1996;17:1576-83.
9. Glazer G 1991, Atherogenic effects of anabolic steroids on serum lipid levels. Arch. of Int'l Med. 151: 1925-33
10. Pope Jr HG, Katz DL 1994, Psychiatric and medical effects of anabolic-androgenic steroid use. Arch Gen Psych 51:375-82

11. Pope Jr HG, Kouri EM, Hudson JI 2000, Effects of supraphysiological doses of testosterone on mood and aggression in normal men: a randomized controlled trial. Arch Gen Psych 57:133-40

12. Thiblin I, Lindquist O, Rajs J 2000, Causes and manner of death among users of anabolic androgenic steroids. J Forensic Sci 45:16-23

These studies are "peer-reviewed", which means that the articles have been reviewed by experts in the relevant fields for the design of the study and the accuracy of the conclusions.

c. The side-effects of anabolic steroids in the German Democratic Republic doping program have been documented in:

1. Berendonk B. ***Doping. Von der Forschung zum Betrug.*** Reinbeck bei Hamburg: Rowohlt Taschedbuchverlag, 1992: 448 pp.

2. Franke WW, Berendonk B. Hormonal doping and androgenization of athletes: A secret program of the German Democratic Republic government. Clin Chem 1997; 43:1262-79.

As one of the Associate Editors of Clinical Chemistry in 1996-1997, I was responsible for recruiting the latter publication and for stewarding it through the peer review and publication process.

d. Through my experience at USADA and running the IOC-accredited drug-testing laboratory at Indiana University, I have had the opportunity to learn from athletes about the side effects which they personally perceived based on their own admitted use of anabolic steroids. They described the following side effects:

1. Acne, particularly on the face and upper back;
2. Male pattern baldness;
3. Growth of hair on the face, back, chest, abdomen, arms, and legs;
4. Aggressiveness, extreme mood swings, and "roid rage";
5. Changes in liver function tests;
6. Disturbances of menstrual cycle (females); and
7. Deepening or coarseness of the voice (females).

e. I am familiar with the anabolic steroid methenelone. It is generally accepted

knowledge within the medical community that methenelone is an anabolic steroid, and that its use can lead to the above-described side effects, among others. I am familiar with the side effects of methenelone based upon my review of the scientific literature and my conversations with others involved in the field of anti-doping. I know from this basis of knowledge that methenelone is commonly administered through an injection, though it may also be administered orally.

f. I am familiar with the anabolic steroid nandrolone. It is generally accepted knowledge within the medical community that nandrolone is an anabolic steroid, and that its use can lead to the above-described side effects, among others. I am familiar with the side effects of nandrolone based upon my review of the scientific literature and my conversations with others involved in the field of anti-doping. I know from this basis of knowledge that nandrolone is commonly administered through an injection, though it may also be administered orally.

g. I am familiar with the anabolic steroid tetrahydrogestrinone (THG). THG was a newly discovered steroid in 2003, and at first, there was some uncertainty as to its exact chemical makeup. I personally oversaw and participated in the studies that verified the structure of THG by mass spectrometry and nuclear magnetic resonance spectrometry, that studied the metabolism of THG in primates, and that demonstrated that THG worked through the androgen steroid receptor in a manner similar to testosterone. These studies demonstrated conclusively that THG is an anabolic steroid, a fact that is now generally accepted knowledge within the medical community. Congress expressly designated THG an anabolic steroid in 2006. I interviewed one former elite Olympic athlete who described for me a number of side effects following her use of tetrahydragestrinone, or THG over a period of months. She described to me the following side effects:

1. Acne, particularly on the face and upper back;
2. Aggressiveness, extreme mood swings, and feeling of invincability;
3. Disturbances of menstrual cycle; and
4. Deepening or coarseness of the voice.

5. As I stated in my January 26, 2009 declaration, I am further familiar with the side-effects of the use of human growth hormone, or HGH. HGH can cause changes to the body by itself or, in connection with other substances, e.g. anabolic steroids and insulin, that can be responsible for the growth of a large number of bodily systems, including muscle, bone, and cartilage. Similar to testosterone, HGH can enhance athletic performance by promoting muscle growth and speeding recovery time for muscles after they have been utilized. Side effects of HGH use can also include an increase in the size of one's head or skull, jaw, hands and fingers, and feet and toes, as well as improved eyesight.

6. My bases for my opinion regarding the effects of human growth hormone include the following:

a. It is generally accepted knowledge within the scientific community that human growth hormone can cause a variety of side effects. The disease acromegaly, for example, is an affliction caused by excess human growth hormone generated by the body. I am familiar with basic medical texts, such as Cecil Textbook of Medicine and Williams Textbook of Endocrinology, which describe these effects. Acromegaly is a relatively slow developing and rare, but treatable, condition, so there is not a large volume of scientific studies on the disease. Nevertheless, the negative health effects of the disease are well-documented (see, for example, Chanson P, Salenave S. Acromegaly. Orphanet J Rare Dis. 2008;25;3:17). I have also spoken with scientists at pharmaceutical companies about the side-effects noted in their clinical trials

with HGH. This information forms the basis for my opinions regarding the side-effects of administered growth hormone.

b. There is peer-reviewed literature support for physical benefits including:

1. Graham MR, Baker JS, Evans P, Kicman A, Cowan D, Hullin D, Thomas N, Davies B. Physical effects of short-term recombinant human growth hormone administration in abstinent steroid dependency. Horm Res. 2008;69:343-54.
2. Healy ML, Gibney J, Russell-Jones DL, Pentecost C, Croos P, Sönksen PH, Umpleby AM. High dose growth hormone exerts an anabolic effect at rest and during exercise in endurance-trained athletes. J Clin Endocrinol Metab. 2003;88:5221-6.
3. Holt RI, Sönksen PH. Growth hormone, IGF-I and insulin and their abuse in sport. Br J Pharmacol. 2008;154:542-56.
4. Stacy JJ, Terrell TR, Armsey TD. Ergogenic aids: human growth hormone. Curr Sports Med Rep. 2004;3:229-33.
5. Sonksen PH. Insulin, growth hormone and sport. J Endocrinol. 2001;170:13-25.

7. It is further my opinion that insulin is a chemical that assists the body to get sugar and other constituents into the cell. As a performance-enhancing substance, insulin is used to regenerate energy stores in the cell (glycogen) and to prevent muscle breakdown. Insulin is frequently used in conjunction with another substance, such as HGH. HGH increases muscle growth while insulin decreases muscle breakdown, resulting in faster recovery and more muscle accumulation than either substance alone could achieve.

8. My bases for my opinion regarding the effects of insulin include the following:

a. It is generally accepted knowledge within the scientific community that insulin regenerates glycogen energy stores and prevents muscle breakdown. I am familiar with basic medical and biochemical texts, such as Cecil Textbook of Medicine and Textbook of Biochemistry with Clinical Correlations, which describe these effects.

b. In addition, there is scientific literature describing the effects of

insulin on cellular metabolism and energy production. Among the peer-reviewed publications describing the use of insulin in sport, the following are representative:

1. Holt RI, Sönksen PH. Growth hormone, IGF-I and insulin and their abuse in sport. Br J Pharmacol. 2008;154:542-56.
2. Sonksen PH. Insulin, growth hormone and sport. J Endocrinol. 2001;170:13-25.

9. I know from my experience, my review of scientific literature, and through my work at USADA that the above-summarized physical side effects of anabolic steroids and human growth hormone can result from a moderate, but not extreme, level of usage of these drugs. While the presence of side effects may vary between individuals, anabolic steroids and human growth hormone are powerful drugs, and their regular usage over a period of time can lead to physiological effects consistent with the above-described effects. For testosterone, this is true whether the exogenous testosterone is administered orally, through an injection, or through a topical cream on the skin.

10. It is a generally accepted proposition within the scientific community that currently the most effective way to administer human growth hormone is through a subcutaneous injection. In addition to conforming to the recommendations of the manufacturers of human growth hormone, I know this to be true through my experience in drug testing and my review of scientific literature.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge at Colorado Springs, Colorado on February 13, 2009.

Larry D. Bowers, Ph.D.
Chief Science Officer
United States Anti-Doping Agency